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1 Anisotropic diffusion of surfaces and functions on surfaces
Chandrajit L. Bajaj, Guoliang Xu
January 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 1

Full text available: 📄 pdf(6.17 MB) Additional Information: full citation, abstract, references, citings, index terms

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Keywords: Loop's subdivision, Riemannian manifold, Surface function diffusion, noise reduction, texture mapping

2 Interactive multi-resolution modeling on arbitrary meshes
Leif Kobbelt, Swen Campagna, Jens Vorsatz, Hans-Peter Seidel
July 1998 **Proceedings of the 25th annual conference on Computer graphics and interactive techniques**

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3 A review of vessel extraction techniques and algorithms
Cemil Kirbas, Francis Quek
June 2004 **ACM Computing Surveys (CSUR)**, Volume 36 Issue 2

Full text available: 📄 pdf(8.06 MB) Additional Information: full citation, abstract, references, index terms

Vessel segmentation algorithms are the critical components of circulatory blood vessel analysis systems. We present a survey of vessel extraction techniques and algorithms. We put the various vessel extraction approaches and techniques in perspective by means of a classification of the existing research. While we have mainly targeted the extraction of blood vessels, neurosvascular structure in particular, we have also reviewed some of the segmentation methods for the tubular objects that show ...

Keywords: Magnetic resonance angiography, X-ray angiography, medical imaging, neurovascular, vessel extraction

4 Multiresolution signal processing for meshes
Igor Guskov, Wim Sweldens, Peter Schröder
July 1999 **Proceedings of the 26th annual conference on Computer graphics and interactive techniques**
Full text available: pdf(10.67 MB)   Additional Information: full citation, references, citings, index terms

Keywords: Laplacian pyramid, irregular connectivity, meshes, multiresolution, subdivision, surface parameterization, wavelets

5 Rendering: Interactive rendering of translucent deformable objects
Tom Mertens, Jan Kautz, Philippe Bekaert, Hans-Peter Seidelz, Frank Van Reeth
June 2003 **Proceedings of the 14th Eurographics workshop on Rendering**

Full text available: pdf(3.04 MB)   Additional Information: full citation, abstract, references, citings, index terms

Realistic rendering of materials such as milk, fruits, wax, marble, and so on, requires the simulation of subsurface scattering of light. This paper presents an algorithm for plausible reproduction of subsurface scattering effects. Unlike previously proposed work, our algorithm allows to interactively change lighting, viewpoint, subsurface scattering properties, as well as object geometry.The key idea of our approach is to use a hierarchical boundary element method to solve the integral describi ...

6 Geometrically deformed models: a method for extracting closed geometric models form volume data
James V. Miller, David E. Breen, William E. Lorensen, Robert M. O'Bara, Michael J. Wozny
July 1991 **ACM SIGGRAPH Computer Graphics , Proceedings of the 18th annual conference on Computer graphics and interactive techniques**, Volume 25 Issue 4

Full text available: pdf(2.02 MB)   Additional Information: full citation, abstract, references, citings, index terms

We propose a new approach to the problem of generating a simple topologically-closed geometric model from a point-sampled volume data set. We call such a model a Geometrically Deformed Model or GDM. A GDM is created by placing a 'seed' model in the volume data set. The model is then deformed by a relaxation process that minimizes a set of constraints that provides a measure of how well the model fits the features in the data. Constraints are associated with each vertex in the model that control ...

Keywords: constraint minimization, deformable models, geometric modelling, volume modelling, volume visualization

7 Spherical parametrization and remeshing
Emil Praun, Hugues Hoppe
July 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 3

Full text available: pdf(28.33 MB)   Additional Information: full citation, abstract, references, citings

The traditional approach for parametrizing a surface involves cutting it into charts and mapping these piecewise onto a planar domain. We introduce a robust technique for directly parametrizing a genus-zero surface onto a spherical domain. A key ingredient for making such a parametrization practical is the minimization of a stretch-based measure, to

reduce scale-distortion and thereby prevent undersampling. Our second contribution is a scheme for sampling the spherical domain using uniformly sub ...

Keywords: geometry images, meshes, remeshing, texture mapping

8 Progressive point set surfaces

Shachar Fleishman, Daniel Cohen-Or, Marc Alexa, Cláudio T. Silva

October 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 4

Full text available: pdf(184.27 KB)   Additional Information: full citation, abstract, references, citings, index terms

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Keywords: Moving least squares, point-based modeling, surface representation and reconstruction

9 Implicit fairing of irregular meshes using diffusion and curvature flow

Mathieu Desbrun, Mark Meyer, Peter Schröder, Alan H. Barr

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10 Semi-regular mesh extraction from volumes

Zoë J. Wood, Peter Schröder, David Breen, Mathieu Desbrun

October 2000 **Proceedings of the conference on Visualization '00**

Full text available: pdf(4.93 MB)   Additional Information: full citation, citings, index terms

Keywords: implicit functions, level set methods, semi-regular meshes, subdivision, surface extraction, volumes

11 Vision and the graphical simulation of spatial structure

W. A. van de Grind

January 1987 **Proceedings of the 1986 workshop on Interactive 3D graphics**

Full text available: pdf(3.51 MB)   Additional Information: full citation, abstract, references, citings, index terms

One important message of this paper is that vision research is highly relevant to 3D graphics technology and that modern electronic graphical systems can and soon will strongly stimulate the further development of vision science. First an outline is given of ecological optics, the discipline trying to describe the visual information available to an active (mobile, structure-seeking) observer. Whereas ecological optics describes the available visual structure, the observables, psychophysics ...

12 Controllable morphing of compatible planar triangulations

October 2001 **ACM Transactions on Graphics (TOG)**, Volume 20 Issue 4

Full text available: ▣ pdf(1.90 MB)   Additional Information: full citation, abstract, references, citings, index terms, review

Two planar triangulations with a correspondence between the pair of vertex sets are compatible (*isomorphic*) if they are topologically equivalent. This work describes methods for morphing compatible planar triangulations with identical convex boundaries in a manner that guarantees compatibility throughout the morph. These methods are based on a fundamental representation of a planar triangulation as a matrix that unambiguously describes the triangulation. Morphing the triangulations corres ...

Keywords: Compatible triangulations, controllable Morphing, isomorphic triangulations, linear Morph, local Control, morphing, self-intersection elemination

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Leif Kobbelt, Swen Campagna, Jens Vorsatz, Hans-Peter Seidel
July 1998 **Proceedings of the 25th annual conference on Computer graphics and interactive techniques**
Full text available: 📄 pdf(315.53 KB)   Additional Information: full citation, references, citings, index terms

2 Fixing models: Variational shape approximation
David Cohen-Steiner, Pierre Alliez, Mathieu Desbrun
August 2004 **ACM Transactions on Graphics (TOG)**, Volume 23 Issue 3
Full text available: 📄 pdf(783.93 KB)   Additional Information: full citation, abstract, references
🎬 mov(33:47 MIN)

A method for concise, faithful approximation of complex 3D datasets is key to reducing the computational cost of graphics applications. Despite numerous applications ranging from geometry compression to reverse engineering, efficiently capturing the geometry of a surface remains a tedious task. In this paper, we present both theoretical and practical contributions that result in a novel and versatile framework for geometric approximation of surfaces. We depart from the usual strategy by casting ...

Keywords: Lloyd's clustering algorithm, anisotropic remeshing, geometric approximation, geometric error metrics, surfaces

3 Polyhedral subdivision methods for free-form surfaces
Ahmad H. Nasri
January 1987 **ACM Transactions on Graphics (TOG)**, Volume 6 Issue 1
Full text available: 📄 pdf(2.97 MB)   Additional Information: full citation, abstract, references, citings, index terms, review

One of the central issues in computer-aided geometric design is the representation of free-form surfaces which are needed for many purposes in engineering and science. Several limitations are imposed on most available surface systems: the rectangularity of the network describing a surface and the manipulation of surfaces without regard to the volume enclosed are examples. Polyhedral subdivision methods suggest themselves as a solution to these problems. Their use, however, is not widespread ...

4 Multiresolution analysis for surfaces of arbitrary topological type
Michael Lounsbery, Tony D. DeRose, Joe Warren
January 1997 **ACM Transactions on Graphics (TOG),** Volume 16 Issue 1

Full text available: pdf(4.63 MB)   Additional Information: full citation, abstract, references, citings, index
terms

Multiresolution analysis and wavelets provide useful and efficient tools for representing
functions at multiple levels of detail. Wavelet representations have been used in a broad
range of applications, including image compression, physical simulation, and numerical
analysis. In this article, we present a new class of wavelets, based on subdivision surfaces,
that radically extends the class of representable functions. Whereas previous two-
dimensional methods were restricted to functions dif ...

Keywords: compression, geometriac modeling, level-of-detail control, splines, subdivision
surfaces, wavelets

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Keywords: Laplacian pyramid, irregular connectivity, meshes, multiresolution, subdivision, surface parameterization, wavelets

8 Machine interpretation of CAD data for manufacturing applications
Qiang Ji, Michael M. Marefat
September 1997 **ACM Computing Surveys (CSUR)**, Volume 29 Issue 3

Full text available: pdf(1.90 MB)   Additional Information: full citation, abstract, references, citings, index terms, review

Machine interpretation of the shape of a component for CAD databases is an important problem in CAD/CAM, computer vision, and intelligent manufacturing. It can be used in CAD/CAM for evaluation of designs, in computer vision for machine recognition and machine inspection of objects, and in intelligent manufacturing for automating and integrating the link between design and manufacturing. This topic has been an active area of research since the late '70s, and a significant number of computat ...

Keywords: artificial intelligence, automated process planning, computer-aided design, computer-integrated manufacturing, feature recognition, flexible automation

9 Anisotropic diffusion of surfaces and functions on surfaces
Chandrajit L. Bajaj, Guoliang Xu
January 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 1

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Keywords: Loop's subdivision, Riemannian manifold, Surface function diffusion, noise reduction, texture mapping

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Zoë J. Wood, Peter Schröder, David Breen, Mathieu Desbrun
October 2000 **Proceedings of the conference on Visualization '00**

Full text available: pdf(4.93 MB)   Additional Information: full citation, citings, index terms

Keywords: implicit functions, level set methods, semi-regular meshes, subdivision, surface extraction, volumes

11 Guaranteeing the topology of an implicit surface polygonization for interactive modeling
Barton T. Stander, John C. Hart
August 1997 **Proceedings of the 24th annual conference on Computer graphics and interactive techniques**

Full text available: pdf(372.49 KB)   Additional Information: full citation, references, citings, index terms

Keywords: Morse theory, catastrophe theory, critical points, implicit surfaces, interactive modeling, interval analysis, particle systems, polygonization, topology

12 <u>Geometrically deformed models: a method for extracting closed geometric models form volume data</u>

James V. Miller, David E. Breen, William E. Lorensen, Robert M. O'Bara, Michael J. Wozny

July 1991 **ACM SIGGRAPH Computer Graphics , Proceedings of the 18th annual conference on Computer graphics and interactive techniques**, Volume 25 Issue 4

Full text available: <u>pdf(2.02 MB)</u>   Additional Information: <u>full citation, abstract, references, citings, index terms</u>

We propose a new approach to the problem of generating a simple topologically-closed geometric model from a point-sampled volume data set. We call such a model a Geometrically Deformed Model or GDM. A GDM is created by placing a 'seed' model in the volume data set. The model is then deformed by a relaxation process that minimizes a set of constraints that provides a measure of how well the model fits the features in the data. Constraints are associated with each vertex in the model that control ...

Keywords: constraint minimization, deformable models, geometric modelling, volume modelling, volume visualization

13 <u>Anisotropic polygonal remeshing</u>

Pierre Alliez, David Cohen-Steiner, Olivier Devillers, Bruno Lévy, Mathieu Desbrun

July 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 3

Full text available: <u>pdf(19.95 MB)</u>   Additional Information: <u>full citation, abstract, references, citings, index terms</u>

In this paper, we propose a novel polygonal remeshing technique that exploits a key aspect of surfaces: the intrinsic *anisotropy* of natural or man-made geometry. In particular, we use curvature directions to drive the remeshing process, mimicking the lines that artists themselves would use when creating 3D models from scratch. After extracting and smoothing the curvature tensor field of an input genus-0 surface patch, lines of minimum and maximum curvatures are used to determine appropria ...

Keywords: anisotropic sampling, approximation theory, lines of curvatures, polygon meshes, surface remeshing, tensor fields

14 <u>Implicit fairing of irregular meshes using diffusion and curvature flow</u>

Mathieu Desbrun, Mark Meyer, Peter Schröder, Alan H. Barr

July 1999 **Proceedings of the 26th annual conference on Computer graphics and interactive techniques**

Full text available: <u>pdf(1.76 MB)</u>   Additional Information: <u>full citation, references, citings, index terms</u>

15 <u>Three-dimensional medical imaging: algorithms and computer systems</u>

M. R. Stytz, G. Frieder, O. Frieder

December 1991 **ACM Computing Surveys (CSUR)**, Volume 23 Issue 4

Full text available: <u>pdf(7.38 MB)</u>   Additional Information: <u>full citation, references, citings, index terms, review</u>

Keywords: Computer graphics, medical imaging, surface rendering, three-dimensional imaging, volume rendering

16 Compatible Triangulations of Spatial Decompositions
William J. Schroeder, Berk Geveci, Mathieu Malaterre
October 2004 **Proceedings of the conference on Visualization '04**

Full text available: pdf(268.01 KB)   Additional Information: full citation, abstract

We describe a general algorithm to produce compatible 3D triangulations from spatial decompositions. Such triangulations match edges and faces across spatial cell boundaries, solving several problems in graphics and visualization including the crack problem found in adaptive isosurface generation, triangulation of arbitrary grids (including unstructured grids), clipping, and the interval tetrahedrization problem. The algorithm produces compatible triangulations on a cell-by-cell basis, using a m ...

Keywords: triangulation, tetrahedrization, adaptive grid, clipping, contouring, template, Delaunay, parallel

17 Session 1: Domain decomposition for multiresolution analysis
Ioana M. Boier-Martin
June 2003 **Proceedings of the 2003 Eurographics/ACM SIGGRAPH symposium on Geometry processing**

Full text available: pdf(4.24 MB)   Additional Information: full citation, abstract, references

This paper describes a method for converting an arbitrary mesh with irregular connectivity to a semi-regular multiresolution representation. A shape image encoding geometric and differential properties of the input model is computed. Standard image processing operations lead to an initial decomposition of the model that conforms to its salient features. A triangulation step performed on the resulting partition in image space, followed by resampling and multiresolution analysis in object space, c ...

Keywords: geometry images, model segmentation, multiresolution, subdivision surfaces

18 Session 5: Multi-chart geometry images
P. V. Sander, Z. J. Wood, S. J. Gortler, J. Snyder, H. Hoppe
June 2003 **Proceedings of the 2003 Eurographics/ACM SIGGRAPH symposium on Geometry processing**

Full text available: pdf(19.27 MB)   Additional Information: full citation, abstract, references, citings, index terms

We introduce multi-chart geometry images, a new representation for arbitrary surfaces. It is created by resampling a surface onto a regular 2D grid. Whereas the original scheme of Gu et al. maps the entire surface onto a single square, we use an atlas construction to map the surface piecewise onto charts of arbitrary shape. We demonstrate that this added flexibility reduces parametrization distortion and thus provides greater geometric fidelity, particularly for shapes with long extremities, hig ...

19 Rendering: Interactive rendering of translucent deformable objects
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Keywords: Moving least squares, point-based modeling, surface representation and reconstruction

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